Research Note

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THINNING AND FERTILIZING INCREASE GROWTH IN A WESTERN WHITE PINE SEED PRODUCTION AREA

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ABSTRACT

Thinning increased diameter growth of 40-year-old western white pine trees by 39 percent. Fertilizing with N and NPK had no effect in unthinned plots, but caused an additional increase of 36 percent in diameter growth in thinned plots. Height growth was not affected by thinning or fertilizing.

Thinning and fertilizer treatments were applied in a vigorous 40-year-old western white pine (Pinus monticola Dougl.) plantation in northern Idaho.[2] The objectives were to determine effects on tree vigor and on seed production.[3] This paper reports the effects on tree vigor in terms of diameter and height growth response only.

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[1] Associate Silviculturists, headquartered at Intermountain Station's Forestry Sciences Laboratory, Moscow, Idaho, which is maintained in cooperation with the University of Idaho.

[2] This study was established by Burton V. Barnes in the Cathedral Peak Seed Production Area in 1959. The Coeur d'Alene National Forest assisted in the establishment and maintenance of this study. The fertilizer was contributed by Cominco Products, Inc., Spokane, Washington.

[3] Barnes, Burton V. Effects of thinning and fertilizing on production of western white pine seed. J. Forest. (In press.)

METHODS

Two 3-acre blocks were selected for the study. In the fall of 1959, three approximate levels of thinning were established in each block: (1) no thinning (original spacing of 9 X 9 feet), (2) thinned to 20 X 20 feet, and (3) thinned to 30 X 30 feet. Measurements after thinning revealed that the 20- and 30-foot spacings were not achieved.[4] Spacing actually averaged about 22 feet for the 20 X 20 level and about 25 feet for the 30 X 30 level.

Three plots for testing fertilizer were installed within each thinning level in 1960. Plot 1 was not fertilized; the other two plots were each fertilized in 1960, 1961, and 1962 immediately preceding fall precipitation. Plot 2 was fertilized with ammonium nitrate at a rate that provided 300 pounds of elemental nitrogen (N) per acre at each application. Plot 3 was fertilized with a complete (13-13-13) formulation at a rate that provided 312 pounds per acre of elemental nitrogen (N), 136 of phosphorus (P), and 259 of potassium (K) at each application.

Diameter and height were measured on three trees in each plot at the beginning and end of the 4-year period, 1961-1964. To determine if variations occurred from year to year within the 4-year measurement period, annual height increments were measured on two of these trees.

RESULTS

During the 4 years of growth measurement, thinning increased the average annual diameter growth of sample trees by 39 percent (fig. 1). Fertilizing with N or NPK did not affect diameter growth in unthinned plots, but caused an additional increase of 36 percent in growth where thinning had been done. Differences between the two thinning levels and between the two fertilizers were not statistically significant.

Height growth was not stimulated by any of the thinning or fertilizer treatments.

[4] Ibid.

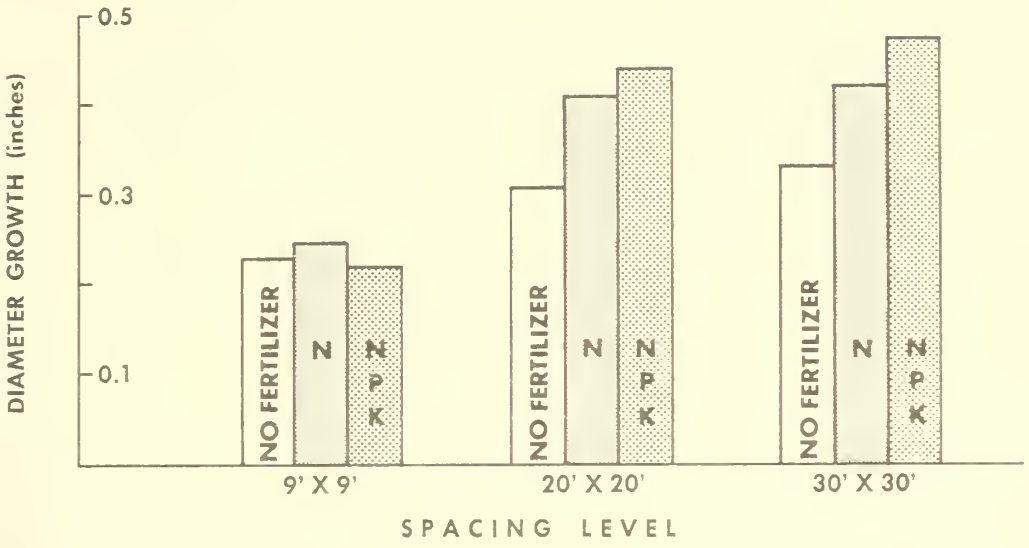

Figure 1.--Mean annual diameter growth of sample trees during the 4-year measurement period.

DISCUSSION

Analyses of soil samples taken from the study area before treatment indicated that levels of N, P, and K were low, so a growth response to fertilization was expected. The substantial increase in diameter growth after fertilization in thinned plots demonstrated that nutrient supply, especially of N, had been below optimum. The addition of P and K did not produce additional growth to the extent anticipated.

Lack of additional response to the wider of the two thinning treatments is to be expected for two reasons. The two levels were actually not very different, and the trees would not be able to utilize the additional growing space beyond 20 X 20 feet until several years after thinning.

The complete lack of growth response to fertilizer within the unthinned plots deserves special comment. It emphasizes that growth is controlled by the "most limiting factor." In the unthinned white pine, this factor was probably soil moisture deficiency due to intense competition. Thinning apparently reduced competition for moisture sufficiently to allow a growth response to fertilization.